

between the two esters in their effect on serum alpha-tocopherol. These results support the hypothesis that there was no biodiscrimination between these two forms of vitamin E.

Pigs fed diets supplemented with esters had higher apparent vitamin E balance than pigs fed BASAL. Vitamin E balance takes into account the major sources of vitamin E in the diet and feces; alpha, gamma, and supplemented esters. This may be a more appropriate method for accessing vitamin

E status than apparent absorption of individual forms of vitamin E.

#### Summary

Both dl-alpha-tocopheryl acetate and d-alpha-tocopheryl succinate were efficiently hydrolyzed in the intestine by swine and were effective in raising serum level of alpha-tocopherol.



## Determination of the Optimum Concentration of Spray Dried Porcine Plasma in Diets for Weanling Pigs

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### Introduction

Previous trials conducted by our group used spray dried porcine plasma (SDPP) at an arbitrary inclusion rate of 10 percent in diets of weanling pigs. However, information is not available on the optimum level of SDPP in diets. Therefore, an experiment was conducted to investigate pig performance over a range of inclusion levels.

The diets used were similar to those used in previous experiments—a basal corn-soybean meal-dried whey diet with different concentrations of SDPP.

### Materials And Methods

Thirty-five, 28-day-old pigs averaging 7.1 kg initial body weight were assigned to five dietary treatments. The diets consisted of a basal corn-soybean meal-dried whey diet to which graded concentrations of SDPP were added and adjustments were made in the content of corn and soybean meal to maintain similar levels of energy and lysine. The composition of the diets is reported in Table 1. The levels of SDPP were: 0, 2, 4, 6, and 8

Table 1. Experimental diets.

| Item                          | Dietary SDPP percent |       |       |       |       | Weeks 3+4 |
|-------------------------------|----------------------|-------|-------|-------|-------|-----------|
|                               | 0                    | 2     | 4     | 6     | 8     |           |
| Corn                          | 45.51                | 47.59 | 49.67 | 51.73 | 53.75 | 45.51     |
| Soybean meal                  | 28.80                | 24.90 | 20.75 | 16.63 | 12.55 | 28.80     |
| Dried whey                    | 20.00                | 20.00 | 20.00 | 20.00 | 20.00 | 20.00     |
| Spray dried porcine plasma    | 0.00                 | 2.00  | 4.00  | 6.00  | 8.00  | 0.00      |
| Soybean oil                   | 2.00                 | 2.00  | 2.00  | 2.00  | 2.00  | 2.00      |
| Calcium carbonate             | .83                  | .80   | .77   | .73   | .69   | .83       |
| Dicalcium phosphate           | 1.00                 | 1.10  | 1.20  | 1.30  | 1.40  | 1.00      |
| Iodized salt                  | .25                  | 0.0   | 0.0   | 0.0   | 0.0   | .25       |
| Trace mineral <sup>a</sup>    | .10                  | .10   | .10   | .10   | .10   | .10       |
| Vitamin premix <sup>b</sup>   | 1.00                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00      |
| Antibiotic <sup>c</sup>       | .50                  | .50   | .50   | .50   | .50   | .50       |
| Ethoxyquin                    | .01                  | .01   | .01   | .01   | .01   | .01       |
| <b>Calculated analysis:</b>   |                      |       |       |       |       |           |
| Metabolizable energy, kcal/kg | 3,329                | 3,330 | 3,322 | 3,312 | 3,305 | 3,329     |
| Crude protein, percent        | 19.82                | 19.57 | 19.20 | 18.84 | 18.50 | 19.82     |
| Lysine, percent               | 1.20                 | 1.20  | 1.20  | 1.20  | 1.20  | 1.20      |
| Methionine, percent           | .32                  | .31   | .29   | .28   | .27   | .32       |
| Sodium, percent               | .33                  | .33   | .44   | .54   | .65   | .33       |

<sup>a</sup>Contributed in mg/kg of diet: Zn, 150; Fe, 175; Mn, 60; Cu, 17.5; I, 2.0.

<sup>b</sup>Contributed per kg of diet: 4,400 IU vitamin A; 1,100 IU vitamin D<sub>2</sub>; 6.6 g riboflavin; 17.6 mg pantothenic acid; 33 mg niacin; 10 mcg vitamin B<sub>12</sub>.

<sup>c</sup>Contributed per kg of diet: 110 mg chlortetracycline; 110 mg sulfathiazole; 50 mg penicillin.

percent. The diets were fed to the piglets for the first two weeks of the experiment, after which pigs were transferred to a common corn-soybean meal-dried whey diet for the last two weeks of the experiment. Feed and water were provided ad libitum. Temperature was maintained between 75 and 85° F. Pigs were penned individually. The experiment lasted 28 days. Pigs, feed and feed wastage were weighed weekly and ADG, ADF and G/F were calculated.

### Results and Discussion

The results for this experiment are reported in Table 2. They are reported in three time periods, the first two weeks, the last two weeks, and the overall four weeks of the experiment.

For the first 2 weeks, ADG increased linearly ( $P<.04$ ) and quadratically ( $P<.07$ ) to increasing SDPP concentrations. The quadratic response results from a maximum reached at the 6 percent level and a decrease at 8 percent. In the same time

period, ADF (linear,  $P<.08$ ) and G/F (linear,  $P<.02$ ) responded in a manner similar to ADG. When fed a common diet in weeks 3 and 4, previous treatment did not influence ADG and ADF, but G/F responded quadratically ( $P<.03$ ) and opposite to the response in weeks 1 and 2. For the overall feeding period (1 to 4 weeks), ADF increased (quadratically,  $P<.09$ ) at intermediate levels of SDPP.

The results of this experiment indicate that for the first two weeks, maximum levels of ADG, ADF, and G/F were reached with the diet containing 6 percent of SDPP. No further increases were obtained with the 8 percent inclusion level. For the total four weeks of the experiment, the data showed maximum performances for pigs fed the diet containing the 6 percent inclusion level of SDPP. Thus, the results suggest that 6 percent SDPP is optimum in a corn-soybean meal-dried whey diet fed for two weeks to pigs weaned at four weeks of age. Because of the limited size of the experiment, additional studies should be conducted to verify these results.

Table 2. Performance of piglets fed different levels of SDPP.

| Item     | Week | Dietary SDPP, percent |     |     |     |     | CV   | P <sup>a</sup> |
|----------|------|-----------------------|-----|-----|-----|-----|------|----------------|
|          |      | 0                     | 2   | 4   | 6   | 8   |      |                |
| ADG,g    | 1+2  | 138                   | 176 | 203 | 251 | 188 | 34.4 | L.04, Q.07     |
|          | 3+4  | 547                   | 551 | 574 | 551 | 557 | 11.8 |                |
|          | 1-4  | 343                   | 364 | 389 | 401 | 373 | 15.6 |                |
| ADF,g    | 1+2  | 243                   | 276 | 294 | 326 | 290 | 23.1 | L.08           |
|          | 3+4  | 741                   | 817 | 846 | 814 | 789 | 14.1 |                |
|          | 1-4  | 492                   | 547 | 570 | 570 | 539 | 13.9 | Q.09           |
| G/F,g/kg | 1+2  | 476                   | 427 | 673 | 759 | 615 | 34.0 | L.02           |
|          | 3+4  | 741                   | 679 | 686 | 682 | 711 | 7.1  | Q.03           |
|          | 1-4  | 691                   | 653 | 687 | 705 | 689 | 7.2  |                |

<sup>a</sup>L=linear, Q=quadratic

## Fiber Utilization by the Pig

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ASL-R751

### Introduction

The survival of the livestock industry of the future, including the pig industry, depends on the ability of animals to compete with humans for the available food supply. Cereal grain production over the years has increased and has provided a relatively cheap and abundant supply of energy feedstuffs for both ruminant and non-ruminant animals. However, the human population is increasing and more cereals are going directly to human consumption. Thus, alternative feed resources have to be considered and most of these may be byproducts of the food and feed industries, which are high in fiber.

Fiber digestion is almost exclusively confined in the large intestine of the pig except in situations where there is slow flow through the stomach and small intestine. The large intestine has microorganisms capable of hydrolysing cell wall components (fiber). Digestibility of fiber by the pig depends on several factors, such as, the type and level of fiber in the diet, age, and live weight. In general, high fiber diets (over 25 percent cell walls) will decrease growth efficiency of the pig and decrease digestibility of other nutrients.

The end products of bacterial fermentation of fiber include acetate, propionate, and butyrate (VFA), and gases (hydrogen, carbon dioxide, and methane). In the pig, VFA are produced at high rates in the cecum and the colon. The relative proportions of VFA may vary with diet and age but they remain within the ranges of 60-75 percent acetate, 15-25 percent propionate, and 10-15 percent butyrate in animals fed concentrate diets including the pig.